



Building opportunities for small-farm agroforestry to supply domestic wood markets in developing countries

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Abstract

The fastest-growing demand for wood products is in domestic markets of developing countries. These markets could offer significant economic opportunities for hundreds of millions of small-scale agroforestry producers, in market niches where they can offer competitive advantages such as control over commercially valuable tree resources, lower cost structure, better monitoring and protection or branding for socially responsible markets. The most promising opportunities for small-scale farmers to sell high-value timber are as outgrowers for industrial buyers or by selling to intermediaries wood grown in agroforestry systems. Farmers located in forest-scarce regions near pulp mills may benefit from outgrower arrangements for pulpwood. Farmers located near inland urban markets may be competitive in some commodity wood and woodfuel markets. Opportunities in processed wood products are mainly in pre-processing, milling to supply low-end products, niches that cannot be efficiently served by industrial-scale producers, and through contracts for selected operations in vertically-integrated industries. To develop viable wood market enterprises, producers must improve their market position, strengthen their organizations, and forge strategic business partnerships. Forest market institutions must adapt by providing business services to small-scale farm producers, investing in regional forest enterprise development to fill gaps in the value chain for wood products, and targeting research, education and training. It is essential to remove policy barriers to small-farm participation in markets, by removing excessive regulations, creating fair and open competitive market environment, and involving farmers' organizations in forest policy negotiations.

Introduction

An estimated 500 million to 1 billion smallholder farmers grow farm trees or manage remnant forests for subsistence and income. Yet most forest-product markets, and market institutions and policy, are structured to serve large-scale natural forest and plantation producers. A major challenge for rural development in developing countries in the twenty-first century will be to reshape efficient markets that also serve small-farm producers.

The first wave of modern agroforestry in the 1970s and 1980s focused attention of policymakers and researchers on enhancing the subsistence, farming input and conservation roles of trees on farms. Some agroforestry projects did promote production for local and national markets, and in the 1990s much attention was paid to developing methods for local farmers and

communities to determine short-term market potentials (e.g., Lecup and Nicholson 2000). The search for commercial opportunities has most commonly focused on higher-value niche export markets in the industrialized countries, even though these account for a small fraction of total demand. Few countries have systematically analyzed, at the sector and sub-sector levels, the potential medium- to long-term competitive advantages for farm-grown tree products in domestic markets.¹ In part because such market analyses and strategies do not exist, agroforestry rarely appears on the 'radar screen' of policymakers, much less in national or regional strategies for rural economic development and poverty reduction.

Yet small-farm participation in commercial wood markets could potentially make a major contribution to rural economic growth, poverty reduction and eco-

system objectives. This paper builds on the findings of an international review² by Forest Trends and the Center for International Forestry Research (CIFOR) of forest product markets for low-income producers in developing countries, to analyze the implications for small-scale agroforestry. It presents a broad analysis of trends in domestic demand for wood products in the developing countries; identifies promising areas where small-farm agroforestry producers have, or could readily develop, a competitive market position; then discusses key actions needed to develop more efficient and lucrative markets for small-farm producers.

Rapid growth in domestic wood demand

Global wood demand grew by more than 50% from the 1960s to the mid-1990s, although per capita consumption was fairly stable on average, even declining in the late 1990s (Gardner-Outlaw and Engelman 1999). Industrialized countries presently consume about 75% of industrial roundwood production (solid wood and panels), but demand in these countries grew by only 0.6% per year during 1961 to 1997. By contrast, consumption grew by 3.2% per year in developing countries during the same period (Bazett 2000). Forest resources play an important role in economic development: to earn foreign currency, to build urban centers and infrastructure, and to provide fuel for industrial production. Looking forward, domestic demand for forest products in developing countries is projected to continue rising in the next few decades, driven mainly by income and population growth. Nonindustrial demand – for products such as fuelwood, construction materials, and rough furniture – is expected to be especially high in those countries in the early stages of economic growth. Urbanization, income growth and new preferences drawn from cross-cultural contact have greatly diversified forest products. New technologies are increasing demand for wood products that are especially attractive financially and feasible for low-income producers to supply. Modern sawmills can utilize a much wider range of tree species than was historically the case. New processing technologies allow commercial use of small-diameter, ‘low-quality’ wood for many higher-value products.

In most developing countries, domestic consumption of wood absorbs the largest share of total production. The proportion is nearly 100% for fuelwood and charcoal production. For industrial roundwood, the proportion is generally over 95%, even in import-

ant exporting countries like Bolivia and Brazil. Over two-thirds of all paper products and pulp for paper produced in most developing countries go for domestic consumption, and the proportion in countries like Angola, China, India, and Mexico is over 90% (FAO 2003). To illustrate the scale of this demand: Brazil’s domestic consumption of tropical timber, estimated at 34 million cubic meters of logs in 1997, exceeded timber consumption in all of the Western European countries combined (Smeraldo and Verissimo 1999).

Timber imports are projected to triple or quadruple in India, China and other forest-scarce developing countries over the next two decades (FAO 2001). Indeed, after trending slightly downward from the 1960s to 1990, the ratio of wood to grain prices has been rising since then (FAO 1998). This shift in relative prices has been one of the basic drivers behind the expansion of agroforestry.

Competitive advantages of small-farm agroforestry

There is thus a promising potential demand for agroforestry products. However, large-scale natural forest producers and plantations, both foreign and domestic, can more economically supply some parts of the market. A large share of forest product demand is ‘commodities,’ that is, highly standardized products purchased in large volumes. Moreover, internal transport costs for wood to major urban markets from many agroforestry areas are high relative to product value. Globalization is encouraging large-scale buyers to seek very-low-cost, high-volume producers. Prices are also kept low by the availability of nonwood substitutes. Continued land-clearing and illegal extraction in many regions supplies wood and NTFPs (nontimber forest products) to the market at a lower cost than can sustainable agroforestry (Scherr et al. 2003). To identify those niches where small farm producers can realistically compete requires assessing their competitive advantages in each particular setting. Four factors may provide such a competitive advantage.

Control of commercially valuable forest resources

During the past 15 years, smallholders’ ownership and control over commercially available tree resources has grown significantly in developing countries, as a result of increased on-farm planting of timber trees (reflecting local scarcities), and devolution of forests

previously controlled by governments to farmers and communities (White and Martin 2002). This control over the primary resource may give smallholders a competitive advantage. Ownership greatly improves their negotiating position with buyers of high-value wood and NTFPs. Producers located near centers of growing consumer or industrial demand, particularly inland cities far from commercial ports, may be competitive with imports or distant suppliers of lower-value products, due to the high cost of internal transport. Smallholders who have secure land tenure may have an advantage over forest communities with unclear ownership rights, and even over large-scale concessionaires or forest owners whose rights may be in dispute from local communities.

Lower cost structure for some products

Some small-scale farm producers may be able and willing to supply products at a lower cost than large-scale or corporate suppliers, because of lower opportunity costs for land and labor, lower production costs from intercropping, or because they value collateral benefits such as local employment, environmental services or local lifestyle. Timber trees can be managed and harvested during periods when labor demands for other activities are low. Farm trees can increase agricultural productivity when grown as windbreaks, fodder banks, live fences, or nurse trees for perennial cash crops. Local producers may be more familiar with local product and processing preferences, more flexible in supplying small quantities as needed to local traders, or providing fresh supplies of perishable NTFPs (Current et al. 1995).

Better monitoring and protection

Local people may have a greater ability than outside companies or agencies to protect forest resources from risks like encroachment, illegal harvest, fire and social unrest, because of superior capacity for monitoring and community interest in forest protection. Insurance companies consider this to be a critical factor in assessing forestry risk and insurability.³

Branding in socially responsible markets

Small-farm producers may be able to secure an advantage in marketing their products to consumers or investors in socially and environmentally responsible market niches, and to companies that are sensitive to

reputation. For example, Fair Trade markets in Europe favor smallholder producers.

Market strategies to manage livelihood risk

Forest markets present two major types of risk to producers. First, prices are often highly erratic – as with many commodities – as a result of cycles of seasonal and year-to-year changes in global supply and demand. Second, the forest processing industry has tended to follow a ‘boom and bust’ cycle: overexploiting cheap forest resources and then moving on. This strategy may make sense for large-scale industrial product buyers or short-term natural forest concessionaires. But for farm producers relying on their own tree resources, it makes more sense to treat them as a long-term capital asset – composed of particular tree species mix and spatial pattern – capable of producing multiple streams of income. Those streams may derive from harvesting different products from a multi-purpose tree, by harvesting at different ages, or harvesting from a different mix of species. Low-income producers need a ‘portfolio’ of products in different income/risk categories, including agricultural and non-farm enterprises. Thus, standing timber trees serve as a ‘savings bank’ for farmers in central Kenya, who can sell them in times of great need. That portfolio will reflect cultural, social and aesthetic values important to local people. Finding at least one product that provides a reliable source of annual income is essential, if such an income flow is not provided by farming or off-farm employment. Non-timber forest products or payments for ecosystem services may also serve this function, though not discussed in this paper (but see Alavalapati et al. 2004).

Risks may be reduced by planting only a portion of the farm in promising market species, using agroforestry configurations, and managing resources in such a way that a variety of different products could potentially be marketed in response to changing market conditions. Establishing small-scale plantations or agroforestry may be done gradually over time, using farm or unemployed community labor, rather than in large parcels all at once, which would require credit to hire labor.

Cash-poor producers need to develop enterprises that require low cash investment, at least initially. External advisers and business-service providers must understand that *ex-ante* analyses based on business models from large-scale commercial production may

not be suitable for small-farm agroforestry systems. Farmers may focus on a more diverse set of products, with more outputs of short rotation, may use assisted natural regeneration more than seedlings, or may use household labor at times when its opportunity cost is lower than the wage rate (Scherr 1995).

Growers can use multipurpose trees for small-diameter wood products and also for food in a lean year. (For example, fruit tree prunings can supply fuelwood and stakes.) Such strategies are more likely than large-scale industrial enterprises to result in landscape patterns and management practices that protect ecosystem services. Land use mosaics may also benefit commercial production through reduced disease incidence, lower monitoring costs, or higher densities of valued 'edge' NTFP species.

Promising market niches for wood products from small-farm agroforestry

The analysis below, summarized in Table 1, assesses which segments of existing and emerging markets are likely to offer real opportunities to small-scale agroforestry producers, and which do not.⁴ Good market analyses are essential to identify the opportunities in specific countries and sub-regions, and these must clearly assess and develop strategies for overcoming existing institutional constraints to linking smallholders with market buyers. It is important to distinguish between markets in which producers are likely to earn only supplemental or 'safety net' income, from those that could raise incomes significantly, with strong development multipliers. Policies should seek to encourage the latter, and not restrict low-income producers to economically stagnant market niches.

Commodity wood

Low-income producers are unlikely to be competitive in export markets for commodity-grade⁵ timber, which require large volumes and high product consistency. When new industrial plantation-grown wood comes into the market beginning in 2005, and a second wave around 2010, sharp downward pressure on prices is predicted (Leslie 1999). By contrast, there is a large potential market for low-income producers in commodity-grade products for segments of domestic markets that do not trade in very large volumes. Urbanization, rural housing and infrastructure construction all demand large quantities of commodity-grade

wood; intensification of agriculture demands wood for fencing, storage structures, crop and tree supports, and packing crates. Iron and steel production depends heavily on wood energy. More than half the total roundwood harvested in developing countries is burned directly as fuelwood or charcoal, and wood-fuel demand rises in the early stages of economic growth, even as growth in use of substitute fuels accelerates. Biomass fuel markets are also increasing in some countries.

These markets could benefit tens of millions of smallholder farmers near rapidly growing inland population centers. Farmers can compete only in markets where buyers need greater supply flexibility, or where transport costs make alternative supplies too costly, such as countries or sub-regions with poor port and transport facilities linking them to international markets or low-cost natural forest supplies. Commodity wood production may be more profitable and lower risk for small-scale farmers if integrated with other components of livelihood strategies, as through agroforestry, by-products from managing timber or tree crop stands, or wood from fallow stands.⁶ Much of total supply has been, and will continue to be, generated as a by-product of the agricultural cycle, e.g., production of woodfuels where land clearance is taking place. Farmers may simply sell stumpage to outside loggers, or sell logs themselves if they can acquire the necessary equipment. Mechanisms for bundling products from small-volume producers, as well as for grading and sorting, are often essential to negotiate reasonable prices from buyers, as are grading and sorting.

Successful smallholder agroforestry and farm forestry for commodity-grade construction wood has been established in a number of forest-scarce countries. Most notable has been the degree of farm forestry in India, based on fast-growing species. Construction wood for national markets is produced by thousands of farmers in Karnataka, India (Deweese and Saxena 1995). A farm forestry scheme developed by a match company works with 30 000 farmers on 40 000 hectares in Uttar Pradesh (Desmond and Race 2000). Dynamic domestic-wood demand provided incentives for small-scale farmers to produce commodity wood in agroforestry systems in Mindanao, the Philippines (ICRAF 2001), and in Bangladesh and Nepal (Arnold and Deweese 1995).

Table 1. Market characteristics that enable small-scale producers to compete.

| Enabling conditions | How conditions benefit small-scale agroforest producers | Comments |
|--|---|--|
| Supply factors | | |
| Low-cost processing technology exists | Can benefit from higher-value segment of market value chain | Economics of 'value-added' location-specific |
| Production technologies locally known | Reduces adoption risks, maintenance costs | Training and extension programs can provide |
| Neutral or declining returns to scale for production | No economic advantage for large-scale producers | Especially where labor-intensive management |
| Limited direct competition from very low-cost producers | Greater potentials distant from ports, distant for agricultural land-clearing | |
| Environmental services can be produced together with forest or agricultural production | Environmental service payments supplement, rather than replace, production income | May require change in landscape design, location of production, management |
| Demand factors | | |
| Large number of buyers (transporters, wholesalers, processors, service users) | More competitive prices and terms of sale for sellers; more interest by buyers in negotiating long-term relationships | Monopsony currently characterizes a majority of forest product and environmental service markets |
| Products with growing demand | Greater opportunity for new entrants | |
| Niche market buyers interested in supporting rural development | Potential to 'brand' product or access higher-paying consumers or investors | Limited scale of market |
| Demand for natural species that are difficult to domesticate, replace | Creates asset value for natural forests, 'volunteer' farm trees | Most species have domesticated or synthetic substitutes |
| Flexible quality standards | Can use greater variety and quality of wood species | Difficult to reliably supply raw materials for international markets |
| Long-term supply contracts offered | Provides more stable income source, reducing livelihood risks | Usually offered by high capital-cost processing firms (e.g., pulpwood) for steady supply |
| Low capital costs of market entry | Existing or low-cost capital equipment for production or processing; low costs to find buyers (e.g., advertising) | Often low-value products; many low-cost technologies exist but not known locally |
| Small and variable volumes are purchased | Producers can move in and out of the market easily; Cases where no economic advantage for large-volume producers | For example, in direct retailing of medicinal plants, local fuelwood markets |
| Open, transparent and unrestricted bidding processes | Avoids discrimination against small-scale suppliers or raw material purchasers | |
| Marketing intermediary established for small-scale producers | Provides 'bundling', technical support, financing; achieves economies of scale in marketing, production | Established by producer cooperatives, NGO's, parastatals, buyer company |
| Market regulation | | |
| Low regulatory costs of market entry | No registration fees; competitive bidding for small timber volumes; low-cost management plans; no bribes required | |
| No producer/consumer subsidies | Greater competitiveness for small-scale producers | Large producers or buyers most benefit from subsidies |
| Low-cost regulatory environment | Few harvest, transport, sales permits required; reduced risk and corruption | |
| Secure local rights for forest products, environmental services | Reduces risk of 'forest grab' by more powerful actors | Especially for long-term product, service contracts |

Source: Scherr et al. (2003).

Table 2. Promising market opportunities and business models for small-scale agroforestry producers.

| Main opportunities will be found where: | Scale of market opportunity for poor | Business models | Potential to raise incomes | Examples |
|--|--------------------------------------|---|----------------------------|--|
| Commodity wood | | | | |
| Forest-scarce inland regions with rapid income or population growth; humid/sub-humid areas | *** | Farm forestry, products sold to local traders | ** | Eucalyptus farming in India (Deweese and Saxena 1995) |
| | | Farm forestry or outgrower schemes that directly link producers with large-scale sawmills, commodity wholesalers or final users | *** | Match Company farm forestry scheme with 30,000 farmers on 40,000 hectares in Uttar Pradesh, India; Kolombangara Forest Products, Ltd. Informal sawlog grower scheme with 100 growers (Desmond and Race 2000) |
| | | Farm forestry, with cooperative wood marketing organization | *** | Widespread in India, Philippines, Bangladesh, Nepal |
| High-quality timber | | | | |
| Mainly in forest-scarce regions with growing incomes and demand for high-value products; good market access; areas with secure tenure; mainly in humid/sub-humid areas | ** | Small farms or communities participate in outgrower or crop-share schemes with private companies to establish plantations of improved high-value timber | ** | Prima Woods project for teak production in Ghana (Mayers and Vermeulen 2002) |
| | | Farmers grow timber at low densities in agroforestry systems and remnant forest to sell cooperatively | *(*) | Philippines Agroforestry Cooperatives (ICRAF 2001) |
| Certified wood | | | | |
| Farmer groups, mainly in humid/sub-humid regions, with high capacity for natural forest management and marketing, that can achieve low certification costs | * | Farm producer groups with established contracts or agreements with certified wood users or market intermediaries | ** | Klabin pulp and paper company of Brazil assists outgrowers to obtain certification and to supply local furniture company demand (Mayers and Vermeulen 2002) |
| Industrial pulpwood | | | | |
| Densely settled, forest-scarce countries with large pulp and paper or engineered wood industry, and limited foreign exchange; farmers located near pulp mills; humid/sub-humid areas | ** | Outgrower arrangements: industry assists farmers to establish and manage pulpwood plantations, in guaranteed supply contracts | *** | Aracruz Cellulose 'timber partner program' in Brazil (Desmond and Race 2000; Saigal, Arora and Rizvi. 2002) |

Table 2 continued.

| Main opportunities will be found where: | Scale of market opportunity for poor | Business models | Potential to raise incomes | Examples |
|--|--------------------------------------|---|----------------------------|---|
| | | Farm forestry: farmers establish plantations with technical support from industry; sell output without purchase contracts | ** | ITC Bhadrachalam Paperboards, Ltd., integrated pulp and paper mill in Andhra Pradesh State, India (Lal 2000; Saigal et al. forthcoming) |
| | | Land leasing by farmers to private companies for pulpwood production | ** | Jant limited wood chipping operation in Madang, Papua New Guinea (Mayers and Vermeulen 2002) |
| Forest product processing | | | | |
| Simple tools, furniture, other basic commodities for poor consumers in growing rural or urban areas | ** | Community or group enterprise | ** | Small-scale processing firms in Africa (Arnold et al. 1994) |
| Sawmilling, in markets where large-scale, high efficiency mills do not compete (humid/sub-humid forest regions) | * | Cooperative community, farmer or group sawmill enterprise with identified buyers | ** | Small-scale logging in the Amazon (Padoch and Pinedo-Vasquez 1996) |
| Finished or semi-finished processing, where commercial links can be forged with businesses serving higher-income consumers | * | Forest community or farmer cooperative for sale direct to wholesalers/retailers | *** | |

High-value wood

Wood demand in high and middle-income countries and urban centers is diversifying into higher-value and specialty products such as finished furniture and home improvement products. Appearance-grade wood for solid wood and veneer may retail for a price three to four times higher than low-quality construction grade timber, and much higher than for low-value products such as fuelwood. Long-term wood-price increases are projected only for these higher-end segments of the market, as a result of the scarcity of large-diameter timber and the greater opportunity to differentiate products (FAO 2001). For example, retail prices for mahogany (*Swietenia* spp.) are 25% higher today than a decade ago (Robbins 2000).

The most valued woods are those grown primarily in natural forests – such as mahogany, red cedar (*Acrocarpus* sp.), and rosewood (*Dalbergia* spp.) – that have become scarce through over-exploitation. But a few appearance-grade timbers, such as teak (*Tectona grandis*), have been domesticated, and fast-growing cultivars can be grown in plantations and on farms. Some mahogany is now grown in plantations (largely outside its native habitat, where the species is susceptible to more pests), though the wood quality is considered inferior (Robbins 2000). Demand is rising for non-traditional appearance-grade wood species, as knowledge about their processing and use characteristics develops (e.g., Vlosky and Aguirre 2001). Research and development on production systems for small-scale farmers working with diverse species has

been weak in the past; there may be significant potential for increasing productivity and marketability (Leslie 1999). Only a minority of low-income farmers will have the stand quality, quantity or market contacts to supply higher-value appearance-grade wood markets. But this still means that millions could benefit⁷, as illustrated by projections by Beer et al. (2000) for Central America. Producers will benefit most economically where they develop long-term partnerships with buyers to produce higher-value products, or where there is active competition among buyers. Models include both timber grown in agroforestry systems, and outgrower farm forestry schemes with private companies. In Ghana for example, the Prima Woods company buys teak from smallholder plantations.

Certified wood

Without major changes in certification processes, few farming communities will directly participate in certification markets. Certification schemes are not presently targeted to small-farm wood producers. Moreover, constraints include very high economies of scale in certification processes, exclusion from the certified 'chain of custody' processes set up by major buyers to ensure that source certification is accurate, dependence on external professional technicians, difficulty identifying potential buyers, and the limited price premium for certified wood. In wood markets where certification is becoming a standard, this is inadvertently erecting another market barrier for small farm producers.

For small-scale farmers to participate in certified wood markets, the costs of achieving certification must be low; location, cost of access and quality must meet market criteria; communities must have direct links to wholesale or retail buyers, to establish chain of custody and ensure access to higher-value markets to justify costs; and producer groups will need partners who are willing to underwrite certification costs and facilitate the process (Rametsteiner and Simula 2001).⁸ For example, Klabin pulp and paper company of Brazil assists outgrowers to obtain certification and supply local furniture company demand (Mayers and Vermeulen 2002).

Greater efforts are needed to facilitate group certification for smallholder farmers, who could benefit significantly in middle-income countries where domestic demand for certified wood is growing. As international agricultural-product buyers become more sensitive to the need for environmentally and socially

sustainable supply chains, interesting new markets are emerging for a variety of farm products specially branded as produced in 'biodiversity-friendly' production systems, as championed in Latin America by the Rainforest Alliance.

Processed wood products

Because the cost of raw material is such a small proportion of the final value of many forest products, local producers often seek to find ways to add value to their product and secure greater market certainty through processing. Exports offer few opportunities for small-scale farmers. While international trade in furniture, moldings, builders' woodwork and other processed tropical wood products grew more than 250% since 1990, from \$1.8 to \$6.5 billion, nearly all tropical exports are from industrial plantations in Indonesia, Malaysia, Thailand, Brazil and the Philippines (ITTO 2003).⁹

By far the largest market for processed wood products of developing country producers will be domestic consumers. In newly industrialized and developing countries, per capita consumption of furniture is typically low, and demand is growing rapidly. Much of this demand will be met by large-scale manufacturing facilities, often in vertically integrated industries and imports; indeed, developing countries account for 10 out of the world's 15 largest net importers (Poschen and Lougren 2001). But there may be significant scope for communities and small-scale producers to manufacture low-end products for local and domestic urban markets, and to supply niche markets that cannot be efficiently served by industrial-scale processors. Millions of small-scale producers could participate profitably in value-added wood processing enterprises, particularly through pre-processing, milling for local markets, contracts for selected operations in vertically integrated industries, and high-value artisanal production near urban centers or exports for specialty markets. Producer groups could subcontract with larger companies for labor-intensive operations, such as upholstering, and production of low-value furniture and wood products (Poschen and Lougren 2001). Production of handicrafts that have economies of small scale and no mechanically produced substitutes may be a low-cost strategy to add value, as may woodworking products that do not have pronounced economies of scale.¹⁰ Small-scale manufacturing enterprises may be able to sub-contract with large-scale companies. Small-scale forest product processing is

already one of the largest and fastest-growing sources of rural non-farm employment. In eastern and southern Africa, woodworking for urban and rural markets grew 10 times as fast as other forest product enterprises (Arnold et al. 1994).

Processing involves additional management complexity and investment. If producers face markets where low cost and high volumes of consistent quality is at a premium, industrial-scale operations will be more competitive. Even where markets are promising, investment to improve milling efficiency and add value will be essential. Fortunately, new technologies have been developed for small-scale wood processing.¹¹ Advantages of on- or near-site processing include returning residues such as bark, sawdust and trimmings back to the forest, flexibility in meeting market demands (i.e., being able to supply as the opportunity arises); reduction of transport costs by reducing logs to commercially recoverable timber on-site; and the ability to harvest and mill the timber in both small and inaccessible areas. Farmers in parts of the Amazon are actively involved in small-scale milling activities (Padoch and Piñedo-Vasquez 1996). From construction-grade wood, lumber of various diameters and grades can be produced, including appearance-grade wood, certified wood furniture, flooring and decorative wood products. Drying kilns can further increase the quality, and thus price, of wood products.

Industrial pulpwood

Demand for industrial pulpwood (chemically-treated wood products) has grown faster than any other market segment in recent decades, and now accounts for more than a quarter of industrial wood consumption. Although technological improvements and recycling have greatly reduced the volume of pulp required in production¹², pulp consumption in developing countries is rising by five percent annually. Continued demand growth is expected, as average paper consumption is only 15 kg per capita per year, as compared to 200 kg in the EU and 300 in the United States. International tropical trade of reconstituted panels, pulp and paper grew by more than 200% during 1990–2002, from \$1.5 to \$5 billion. Most exports are based on wood produced in industrial plantations, with only four countries – Indonesia, Brazil, Thailand and Malaysia – accounting for 94% of export production (ITTO 2003).⁹

Due to improved industrial efficiency, increased availability of low-cost wood, and entry of plantation-

grown wood, pulpwood prices have, however, been declining despite the rapid growth in paper demand. In general, small-scale farmers will not be able to compete with large-scale industrial plantations in most international pulpwood markets on price, scale or reliability. However, pulp production is highly capital-intensive; a single plant may require 1 million to 2 million cubic meter raw material each year (Bazett 2000). Though the raw material represents a small share of total costs, it is essential to have a reliable supply to ensure continuous use of equipment. Thus, in countries with large domestic markets for pulp, and limited scope for large-scale harvest from natural forests, millions of farmers may find commercial opportunities through out-grower arrangements, farm forestry cooperatives, joint ventures with industry or land leasing to private companies. Already, 60% of firms producing wood pulp in developing countries source at least some of their supply from farmers.¹³ In coastal Andhra Pradesh, India, for example, over 40 000 hectares of small-holder farmland are estimated to be under trees suitable for pulp and the district is supplying 700 000 tons of pulpwood annually to different wood-based industries (Mayers and Vermeulen 2002). Furthermore, technological innovations that utilize wood chips to process boards have increased demand for small-diameter wood that can be grown on farms in shorter rotations and for lower quality wood.

Opportunities are geographically limited to areas in close proximity to major pulp mills (within 100 km), with good transportation infrastructure, good growing conditions and uncompetitive agricultural alternatives. For low-income farmers to participate in this market, they require a role in selecting the species to be planted, clear tree rights, financial support while trees mature, good prices; adequate returns on investment, and diversified markets (IIED 1996). For pulp companies to participate, they may need assistance in identifying partners and must adapt operations to the small size of farms and woodlots, and overcome the lack of mutual trust to sign contracts between companies and farmers. Political insecurity may discourage long-term investments/contracts (Mayers and Vermeulen (2002). To safeguard local livelihoods and environment, pulpwood plantations need to be developed in ways that respect conservation guidelines, planting in mosaic patterns that retain areas for natural forest and farming.

Developing markets for farm-grown tree products

Whether producers are able to capitalize on *potential* market advantage depends on the characteristics of the market environment in which they must operate. Experience in both smallholder agriculture and community forestry suggests some of the characteristics of markets that are likely to favor low-income producers. These are identified in Table 2. Small-scale farmers will benefit where production and processing systems have low capital costs, no economies of scale, and where provision of ecosystem services is compatible with economic activities. They benefit from more competitive and open markets (where they do not compete directly with very low-cost producers), in market niches that prefer small-scale suppliers, where local farmers' tree resources provide valued species or ecosystem services, and where costs of market entry are low. Small-scale producers flourish most in regulatory environments with low cost of entry and operation, few burdensome regulations, few subsidies to large industry and secure forest rights. Moreover, where new types of products are being marketed, key actors and functions in the 'value chain' from producer to consumer may also be missing.

Thus, in addition to helping local forest enterprises to develop, which has been the principal focus of smallholder market interventions to date, it will be essential to strengthen forest market institutions to serve small-farm producers and remove policy barriers to local market participation, as articulated also by Puri and Nair (2004) based on experience in India. Lessons from case study analyses and experience of small-farm crop and livestock production suggest some strategies to achieve these.

Develop local forest enterprises

Targeted support is needed to develop local forest enterprises: to improve the market positions of those already operating, strengthen producer organizations to carry out marketing and processing activities, and forge strategic partnerships with large-scale businesses.

Improve market position

To raise incomes significantly, farmers need to analyze the value chain, define the market and establish a competitive position. Sale of low-value wood products with mainly local or *stagnant* regional demand (for example, rough-finished furniture) are important mainly

for the role they play in livelihood security of the poor. These are products for which prices are low and quite competitive because the cost of market entry is low. Low-cost substitutes are often available in these markets, such that earnings and profits are also generally low.

Significant longer-term income growth will depend upon selling products for which there is growing domestic demand, such as construction-grade timber, packing materials, or inexpensive semi-finished furniture. Product differentiation does not exist to any significant extent and prices are competitive, so the main opportunities are likely to be in forest-scarce regions with large populations, especially around urban areas distant from major ports. Success requires building supply networks that link producers to markets and increasing production efficiency.¹⁴ These markets should, in most cases, be the main targets for rural development forestry investment with low-income producers.

A small number of farmers may be able to access high-value specialty markets, mainly high-value timbers and processed products. To be successful in these markets, producers must be highly responsive to consumer preferences and have good marketing strategies. Volumes required are typically lower, but products are highly differentiated and rely on branding or direct linkages with buyers, so marketing costs can be high (Scherr et al. 2003). Success requires close attention to product design, promotion and marketing, and product quality. Producers will typically need to improve production and marketing technology, product quality or reliability of supply, and reduce unit costs (Hyman 1996). As enterprises develop, producer groups will need to seek supplemental investment financing, through grants, public subsidies, rural credit, development banks, or from socially responsible firms. In cases where market-oriented agroforestry development can contribute to forest ecosystem or watershed restoration, conservation finance may be a source.

Strengthen producer organizations

Strong farmer organizations are needed for successful commercial forestry enterprises, to capture the potential gains from vertical and horizontal integration. Farmer organizations may play diverse roles: to mobilize capital for critical investments (for example, through micro-finance), undertake joint processing activities, organize marketing deals or establish product quality or conservation controls. Groups

can contract with intermediaries to assure minimum supplies to a large-scale buyer. In regions with underdeveloped market institutions, groups of producers can work together to overcome value chain 'gaps,' by setting up reliable transport services, recruiting regional traders, establishing log sorting yards or agreeing to quality standards. In the Philippines, for example, farmers in Agroforestry Cooperatives grow timber in agroforestry systems and remnant forests to sell cooperatively (ICRAF 2001). Successful models for capacity-building exist (e.g., Ford 1998, Fisher 2001, Colchester et al. 2003) but will need to be scaled up (Franzel et al. 2004).

Forge strategic business partnership

Strategic business partnerships between private industry and local farm producers can benefit both. Industrial firms can access wood fiber at a competitive cost, along with forest asset production, local ecosystem expertise and social branding opportunities. Local partners can benefit from high-quality planting materials, technical assistance, quality control, investment resources for expansion and marketing and business expertise. Comparative studies of operating forestry partnerships around the world found that effective partnership requires a long-term perspective for business development, flexible contract terms, special attention to reducing business risks (such as spreading sources of supply among different producer groups) and mechanisms to reduce transaction costs (Desmond and Race 2000; Mayer and Vermeulen 2002). Industrial partners, accustomed to specialization, need to respect the diversified livelihood strategies of their lower-income partners.

Strengthen forest market institutions to serve small-farm producers

Historically most commercial forest products flowed through privileged large-scale public forest industry monopolies or multinational companies. As these were often highly vertically integrated, a private sector network of business, financial, technical and marketing services and market infrastructure did not develop to serve smaller-scale, independent producers. Development of the small-farm agroforestry sector requires that such services become available to a large number of producers or producer organizations.

Encourage agroforestry business-service providers

Local business success will often depend on access to essential business services, tailored to meet the special requirements of low-income farm producers. Key elements include management services, organizational support, technical assistance for production and processing, market information, insurance, marketing assistance and financing. In the early stages of local forest-market development, such services rarely exist in most rural communities. They must be provided by nonprofit, public- or civic agencies, or a private business partner. Agricultural extension services need to be strengthened and their scope expanded to include commercial agroforestry. Producer networks may play a role in providing some of these services (Colchester et al. 2003). As local capacity and scale of production expand, the private sector may find profitable opportunities.

Invest in regional forest enterprise development to fill gaps in the value chain

In regions with high potential for commercial small-farm agroforestry, public or quasi-public agencies can serve to accelerate development of the necessary physical market infrastructure and institutions at a regional scale. Such programs may facilitate business partnerships, financing for local forestry businesses, training, developing of grading systems, and other services.¹⁵

Target research, education and training

Forming a commercially viable small-farm agroforestry sector will require developing, disseminating and adapting to new production, processing and management systems. Education and training programs must foster this new expertise, integrating sustainable forest management, business and marketing skills with skills in community facilitation. Research efforts need to focus on technical, economic, institutional and policy problems relevant to this sub-sector.

Remove policy barriers to local market participation

Most developing countries have begun the process of dismantling and reforming forest policies that were originally put in place to tightly control commercial production by privileged, subsidized suppliers, and are moving to a more market-based system. But existing policy frameworks still greatly disadvantage small-scale producers, and aggressive market policy reform

is essential for development of a thriving, legal and sustainably managed small-farm agroforestry system. Reform should include three key elements.

Reduce the excessive regulatory burden

Forest market activity in most developing countries is choked by excessive state regulation. Complex, poorly understood and contradictory regulations from various agencies make compliance difficult and expensive, and encourage selective enforcement (Puri and Nair 2004). There are a plethora of rules that distort markets and burden small-scale producers, maintain product standards biased against producers (such as over-dimensioning of lumber), and set excessive taxes and forest agency service charges. This drives millions of people to operate illegally, and induces farmers to destroy wildlings of tree species whose harvest is regulated by the state (Kaimowitz 2003). Reducing this regulatory burden is essential for small-farm wood producers to develop sustainable enterprises. For example, it should be possible to deregulate markets very quickly for many tree species that are not grown at all in natural forests (ASB 2001).

Create a fair and open competitive market environment for local producers

Forest market policies still widely favor dominant large-scale producers, distributors and buyers, often even establishing official monopoly buyers. For example, rules for bidding on wood from public forests may set minimum lot sizes that effectively exclude small-scale buyers, while eligibility criteria for receiving public subsidies may set a minimum size of farm plantation that excludes most small-scale agroforesters. Lower-income agroforestry producers benefit most from a fair and open competitive market environment consisting of markets with many buyers and sellers, few limitations on market entry or operation, flexible quality and volume requirements, and no subsidies or regulations that favor large-scale actors (Scherr et al. 2003). Certification systems will need to be adapted specifically for small-scale agroforestry producers (Atyi and Simula 2002).

Involve farmers in forest policy negotiations

Local farm producers' active involvement in forest market policy negotiations is needed to promote more practical, realistic and lower-cost laws, market regulations and development plans. In some countries,

democratization has enabled greater participation, and forced greater transparency in forest markets. Forest rights and regulatory reforms have been achieved in some areas, such as southern Mexico (De Walt et al. 2000), through political alliances, involving local producers networks, private industry, government agencies and/or environmental groups that will benefit from sustainable market development.

Conclusions

Trends in forest resource scarcity, ownership, demand for forest products, governance, and forest productivity are opening up unprecedented opportunities for small-scale farms to benefit from commercial markets for wood products from agroforestry systems. A more strategic use of overseas development assistance, non-governmental organization and public funds could leverage these private flows and incentives to transform forest markets and new instruments for ecosystem services into positive contributors to both ecosystem conservation and poverty alleviation.

Wood from small-farm agroforestry and farm forestry systems is likely to supply only a small share of exports of commodity wood or high-value timber, though the benefits farmers receive from this trade could increase. But their role in domestic wood supply could potentially be far larger than it is today, with aggressive efforts to develop the necessary market infrastructure, services and institutions. The impacts on rural-poverty reduction from such a strategy are hard to calculate at this time because they are so dependent on achieving the necessary policy reforms and capacity building. But those impacts could be large during the next 25 to 50 years – benefiting hundreds of millions of low-income people.

End Notes

1. The World Agroforestry Centre, the Center for International Forestry Research, FAO and local collaborators have such studies underway in several African countries.
2. Scherr S.J., White A. and Kaimowitz D. 2003. A New Agenda for Forest Conservation and Poverty Alleviation: Making Markets Work for Low-Income Producers. Forest Trends and CI-FOR: Washington, D.C. www.forest-trends.org
3. ARM and Mundy J. 2000. Policy Risks for the Forest Sector Associated with the Implementation of Kyoto Protocol. Report to Forest Trends. Washington, DC. May.
4. There is little rigorous data documenting small-scale forest producers' experience in these markets in aggregate, or the impacts on their livelihoods. Our analysis, adapted from Scherr, White

- and Kaimowitz (2003), is based largely on case study evidence of 'successes' and 'failures,' and personal observation of the structure and function of existing and emerging forestry markets, and extension of lessons learned from promoting small-holder agriculture in developing countries, which is much better documented than forestry.
5. The term 'commodity' is used in this paper to refer to products characterized by a high level of standardization (tree species, size, quality), which can be traded interchangeably with similar products from other sources, in large-scale national or international markets. This is distinguished from 'niche' or 'specialty' products, which may have unique properties, special uses, or are traded in small lots.
 6. Field analysis of 56 agroforestry systems in eight countries of Central America and the Caribbean found that the payback period for most systems other than woodlots was one to six years. The ratio of benefits to costs was over one in most cases, and over two in eight cases. The most profitable systems for farmers were *taungya*, various types of intercropping, and homegardens (Current et al. 1995).
 7. Where high-value commercial timber is found in public forests, the bulk of revenues is likely to accrue to other actors.
 8. Rametsteiner E. and Simula M. 2001. Forging Novel Incentives for Environment and Sustainable Forest Management. For the European Commission DG Environment. Workshop on Forest Certification, Brussels, Sept. 6-7, pp. 13-72.
 9. ITTO. 2003. Tropical timber trade and production trends. International Tropical Timber Organization, Yokohama, Japan.
 10. For example, an assessment of value-added opportunities for aboriginal forest producers in North America identified: joinery stock, door and window frames, cabinets, flooring, housing components for specialty markets, edge-glued panels for shelving and furniture, finger-jointed products; moldings, garden furniture; canoe paddles, chopsticks, and log homes.
 11. Diverse types of small-scale mills are now available, including chainsaw mills, horizontal band saws, single and double circular saws, and one-person bench sawmills (FFAQI 2000).
 12. The worldwide shift from chemical to mechanical pulping has cut the wood required for a ton of pulp by half (Imhoff 1999). Consumers now recycle a global average of 40% of their paper. Some 30% of global wood fiber for paper now comes from manufacturing residues.
 13. Two dozen examples were documented in a review of community-industry forestry partnerships (Mayers and Vermeulen 2002).
 14. The first wave of farm forestry in India inspired high farmer participation, but led to market saturation and much lower prices than anticipated. During the second wave of farm forestry, market dynamics were widely recognized and incomes have been more reliable (Saigal et al. 2002).
 15. A highly successful example in an impoverished region of Appalachia in the United States is described in Poffenberger M. and Selin S. (eds.) 1998. Communities and Forest Management in Canada and the United States. A Regional Profile of the Working Group on Community Involvement in Forest Management. Berkeley, CA: Forests, People and Policies.
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